Influence of nature of biomass on grindability after torrefaction

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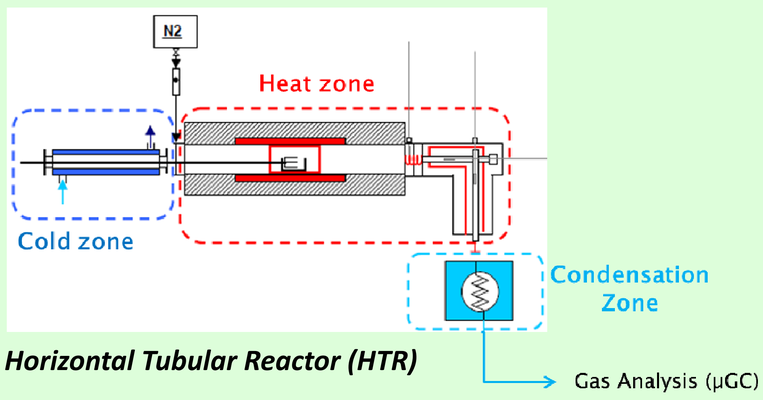
Introduction - Context

High temperature **gasification of biomass** is one of the most promising technologies to produce synfuels or H_2. These operating conditions requires a **fine grinding of biomass**, which is energy costly. Biomass **torrefaction** is a pre-treatment process allowing to **reduce grinding energy consumption**.

Interest of our work: **Grindability** of torrefied solids after torrefaction depend on operating conditions and **nature of biomass**.

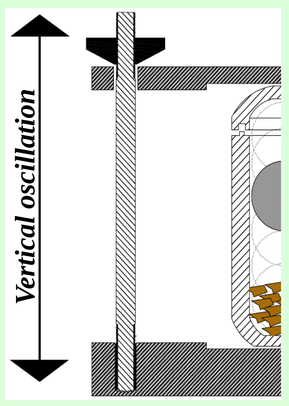
Objective of this study: Characterisation of energy required for grinding before and after torrefaction of **4 types of biomass** : softwood, short rotation coppice poplar, agricultural residue and perennial feedstock.



Horizontal Tubular Reactor (HTR)

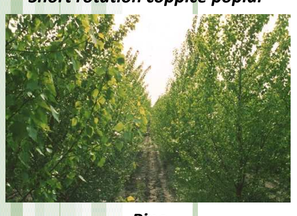
Experimental

- Torrefied biomass at different temperatures with similar weight loss (**≈17 %**) in HTR
- Same grinding protocol (residence time, volume of sample)



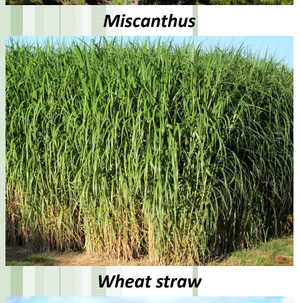
Ball mill

Short rotation coppice poplar

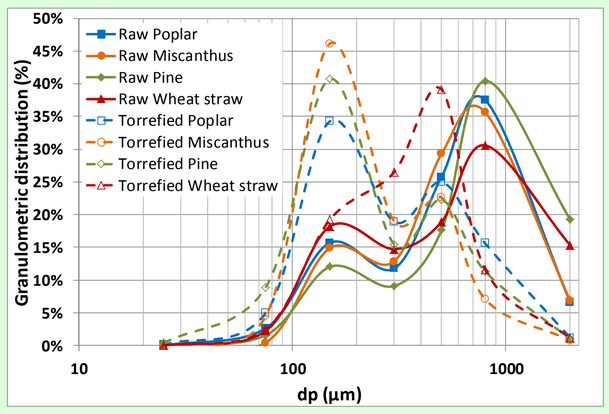


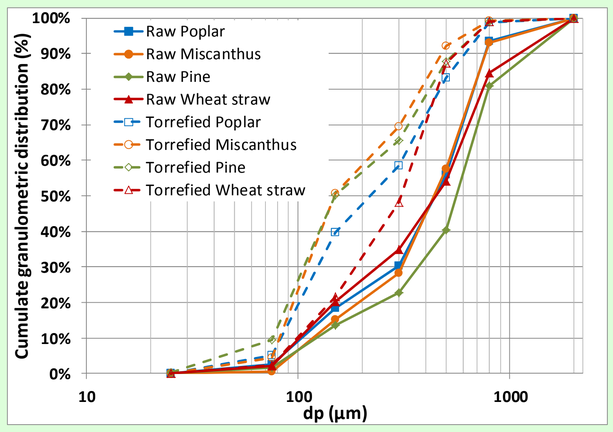
Pine

Miscanthus



Wheat straw

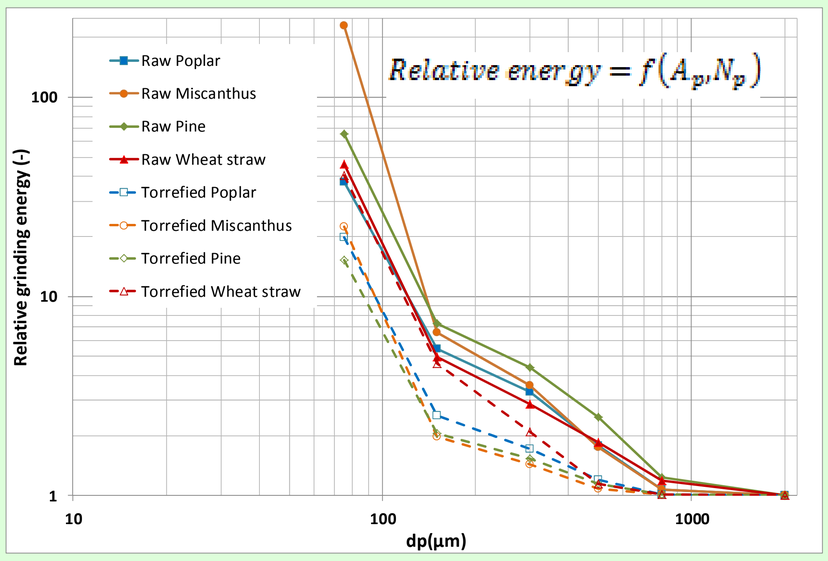




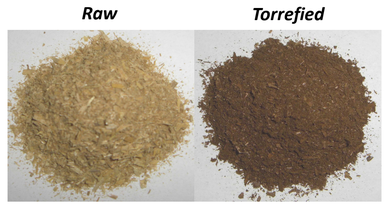
Results

Assumptions:

- Relative energy before grinding = 1
- Shape of particles after grinding: sphere
- Energy proportional to the surface created



Short rotation coppice poplar



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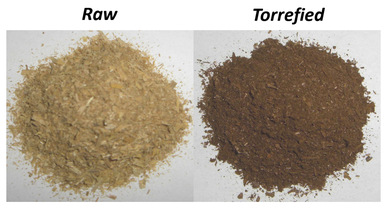

Conclusions

- Torrefaction pretreatment reduces particle size distribution and grinding energy consumption .
- Except for wheat straw, particule size distribution is similar whatever nature of biomass or thermal pretreatment
- Torrefaction gathers grinding energy distributions of different biomasses.
- ***Future works:*** Determine grinding energy consumption after torrefaction at different weight losses